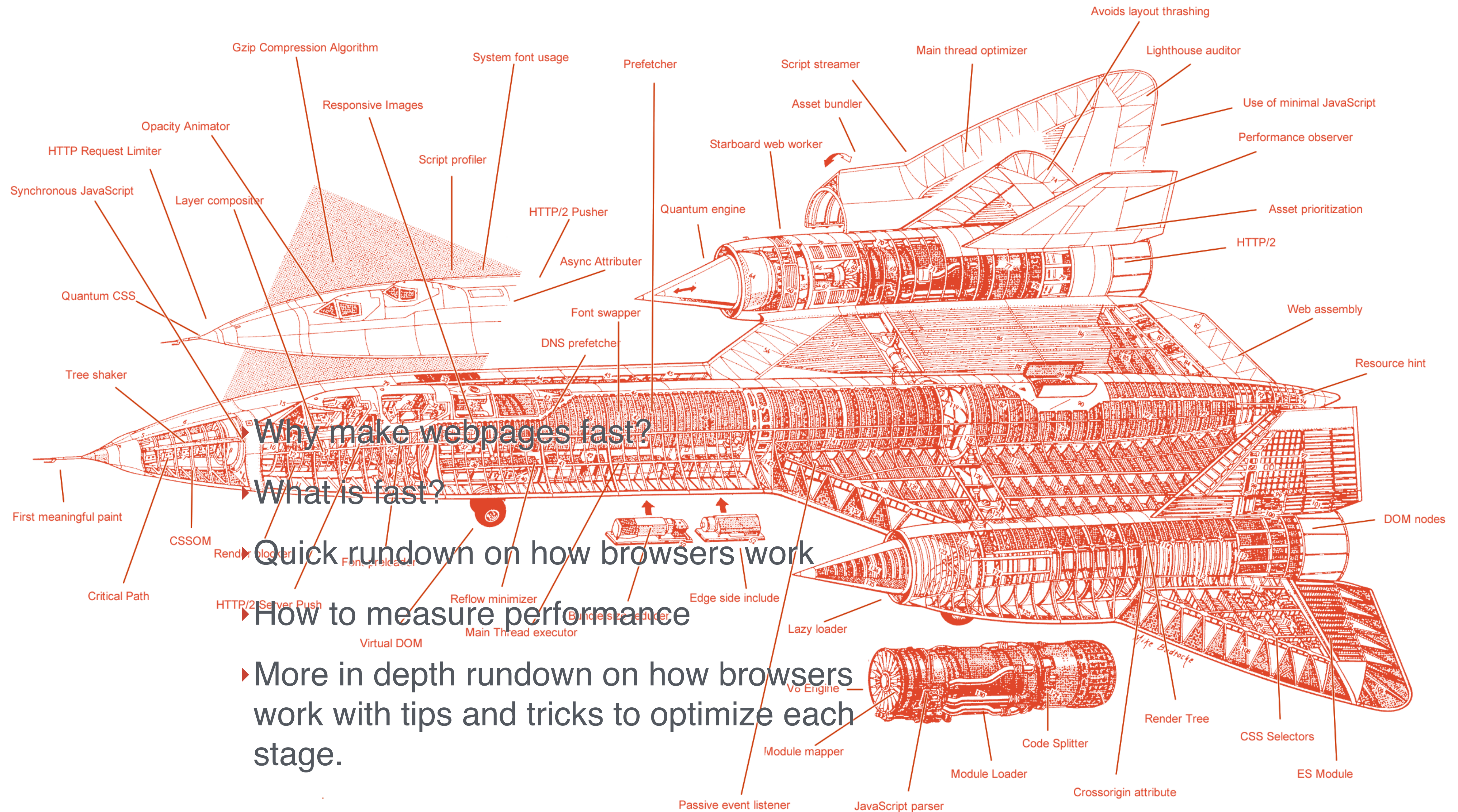


Web Performance in 2019

Mike Herchel

Senior Front-end Dev at Lullabot // @mikeherchel



Why make webpages fast?

What is fast?

Quick rundown on how browsers work

How to measure performance

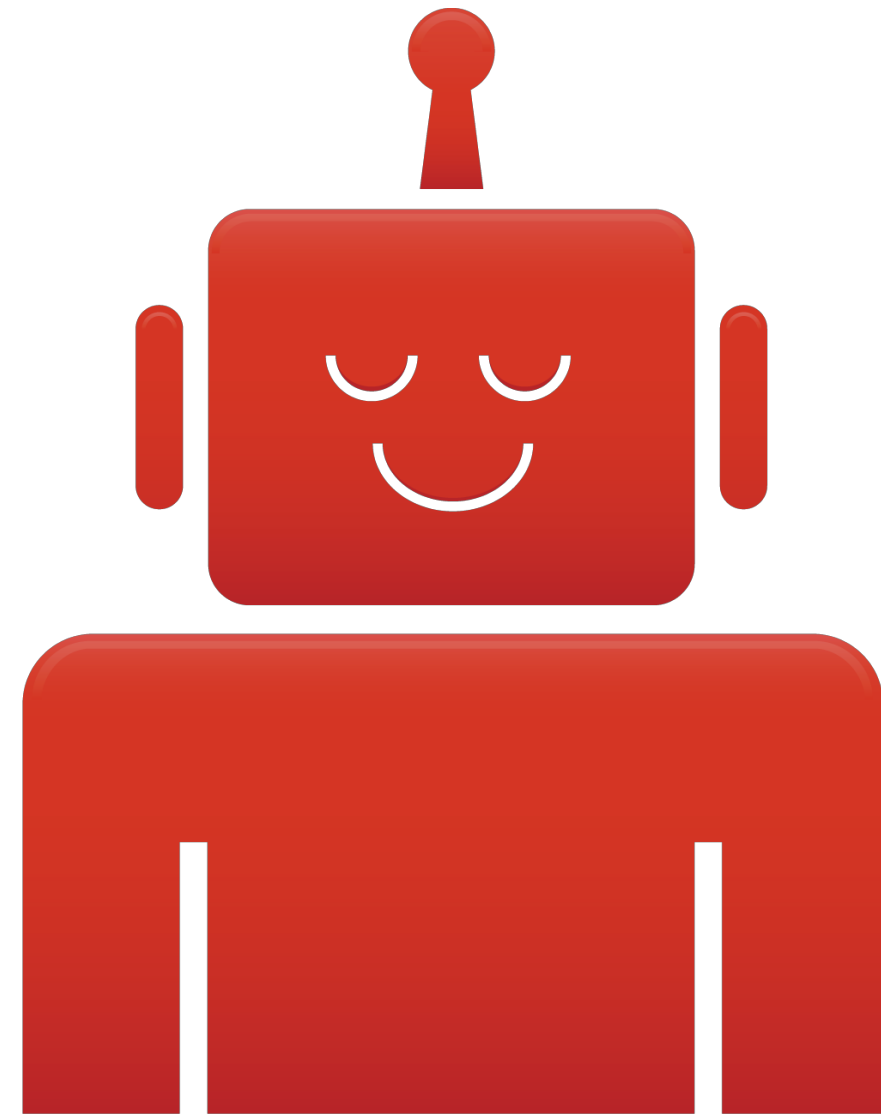
More in depth rundown on how browsers work with tips and tricks to optimize each stage.

Mike Herchel

Millie Herchel

**Dexter
Herchel**






Lullabot™

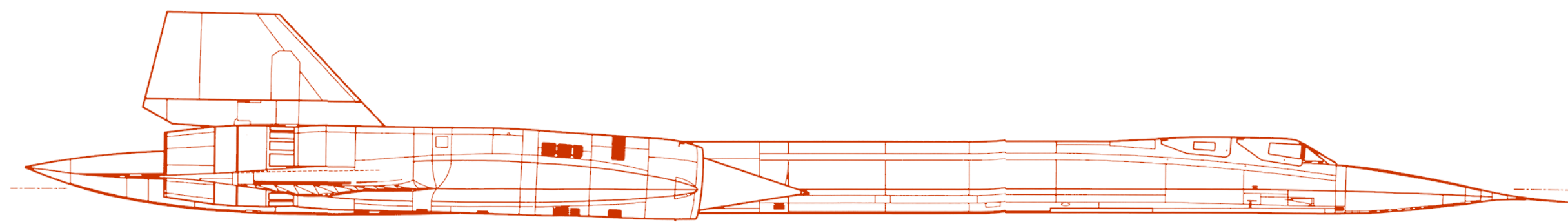
53% of mobile site visits are abandoned if pages take longer than 3 seconds to load.

– <https://www.doubleclickbygoogle.com/articles/mobile-speed-matters/>



Mobile sites load in 5
seconds earn up to 2x
more mobile ad revenue.

– <https://www.doubleclickbygoogle.com/articles/mobile-speed-matters/>



WHAT IS FAST?

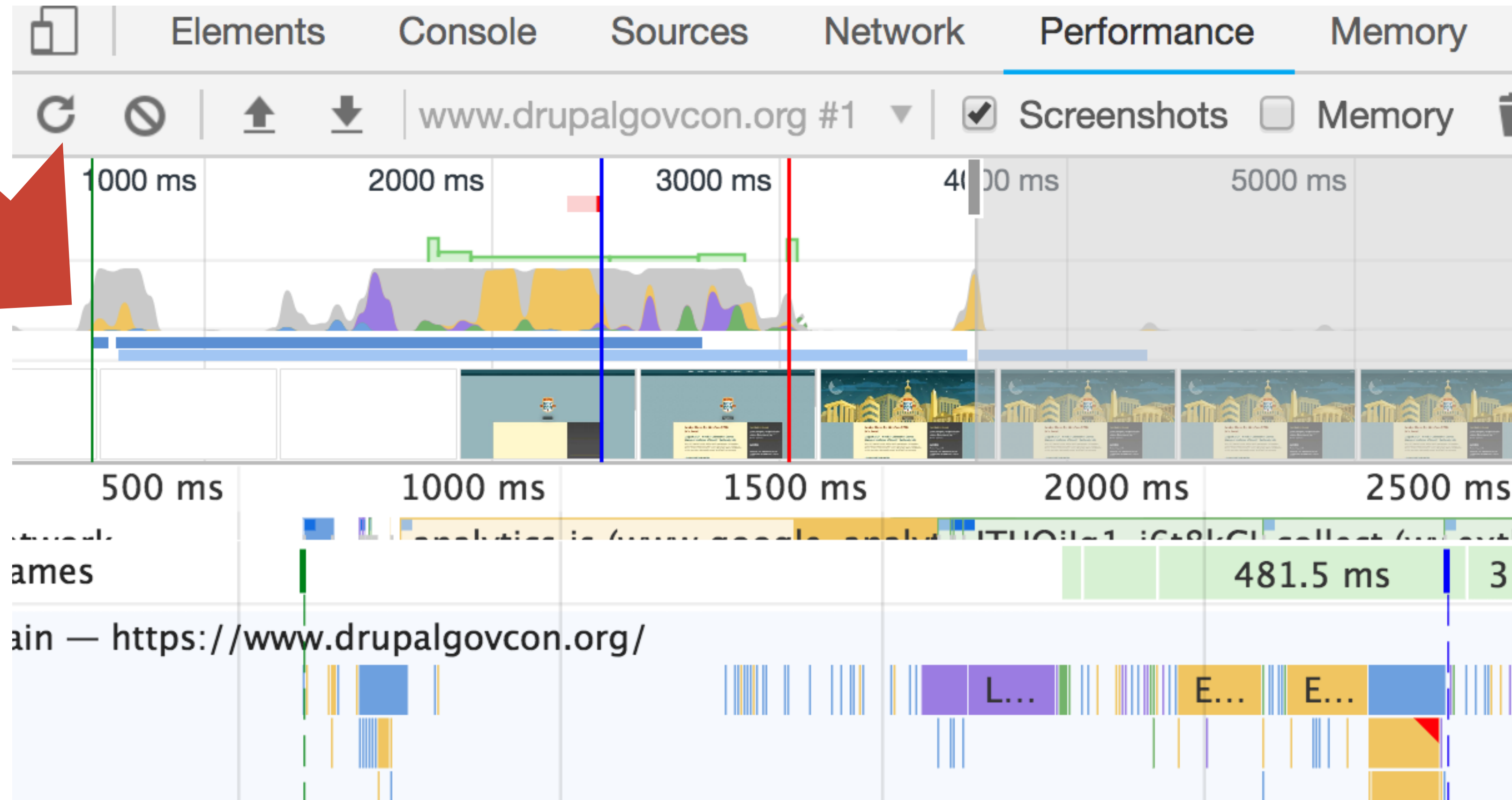
FRONTEND PERFORMANCE METRICS

- ▶ Time to First Byte
- ▶ Time to First Meaningful Paint
- ▶ Time to First Interactive
- ▶ Speed Index

TIME TO FIRST BYTE

- ▶ Time from when you begin navigation until the first byte of the html file hits your browser.
- ▶ Delays here can indicate backend performance issues.
- ▶ Effective caching really helps with this (Drupal FTW)
- ▶ CDNs can dramatically help. They position content closer to the user.

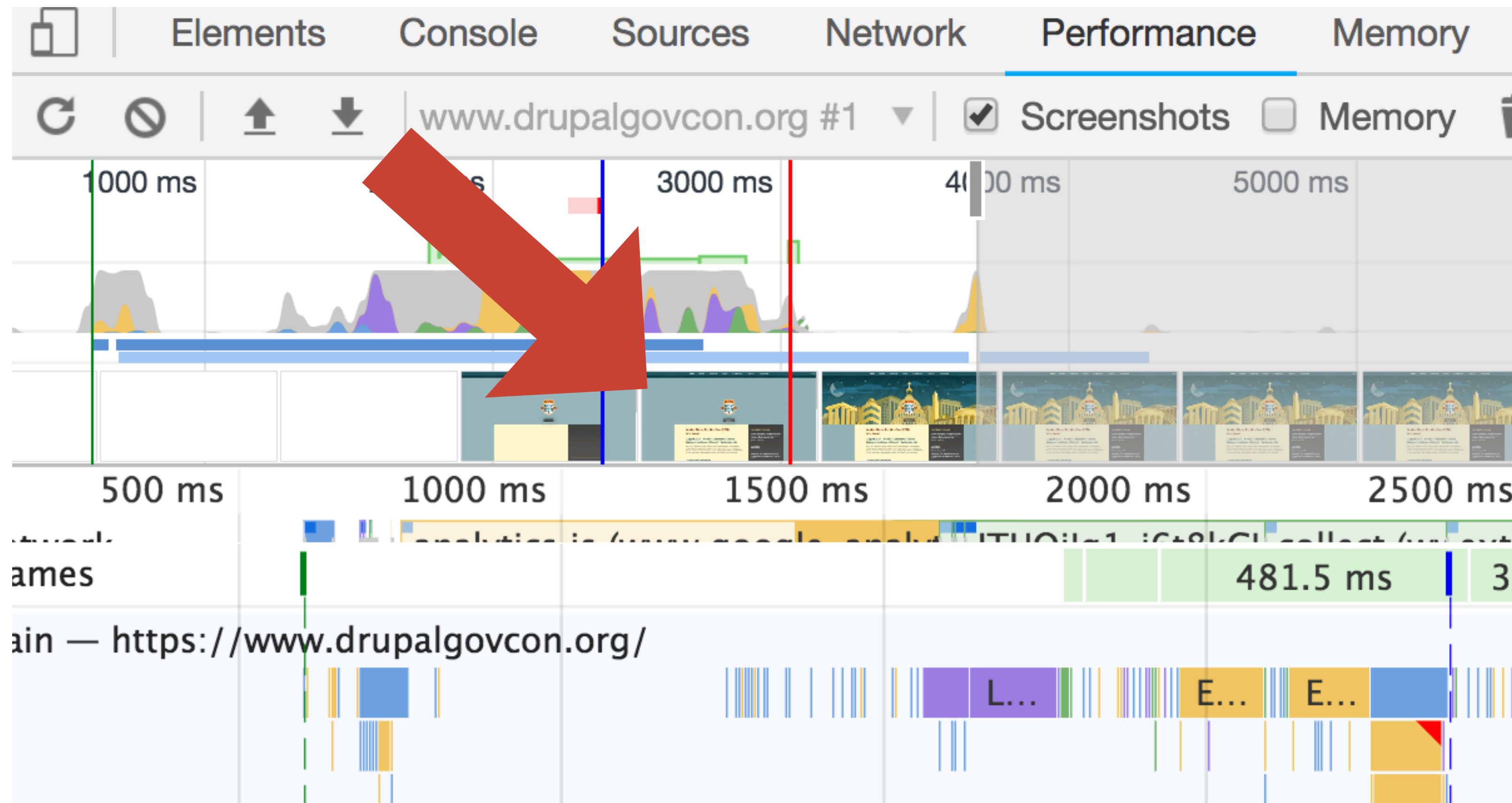
TIME TO FIRST BYTE



TIME TO FIRST MEANINGFUL PAINT

- ▶ Primary content is visible.
- ▶ Marks the paint event that follows the most significant change to layout.
- ▶ Can be ambiguous.

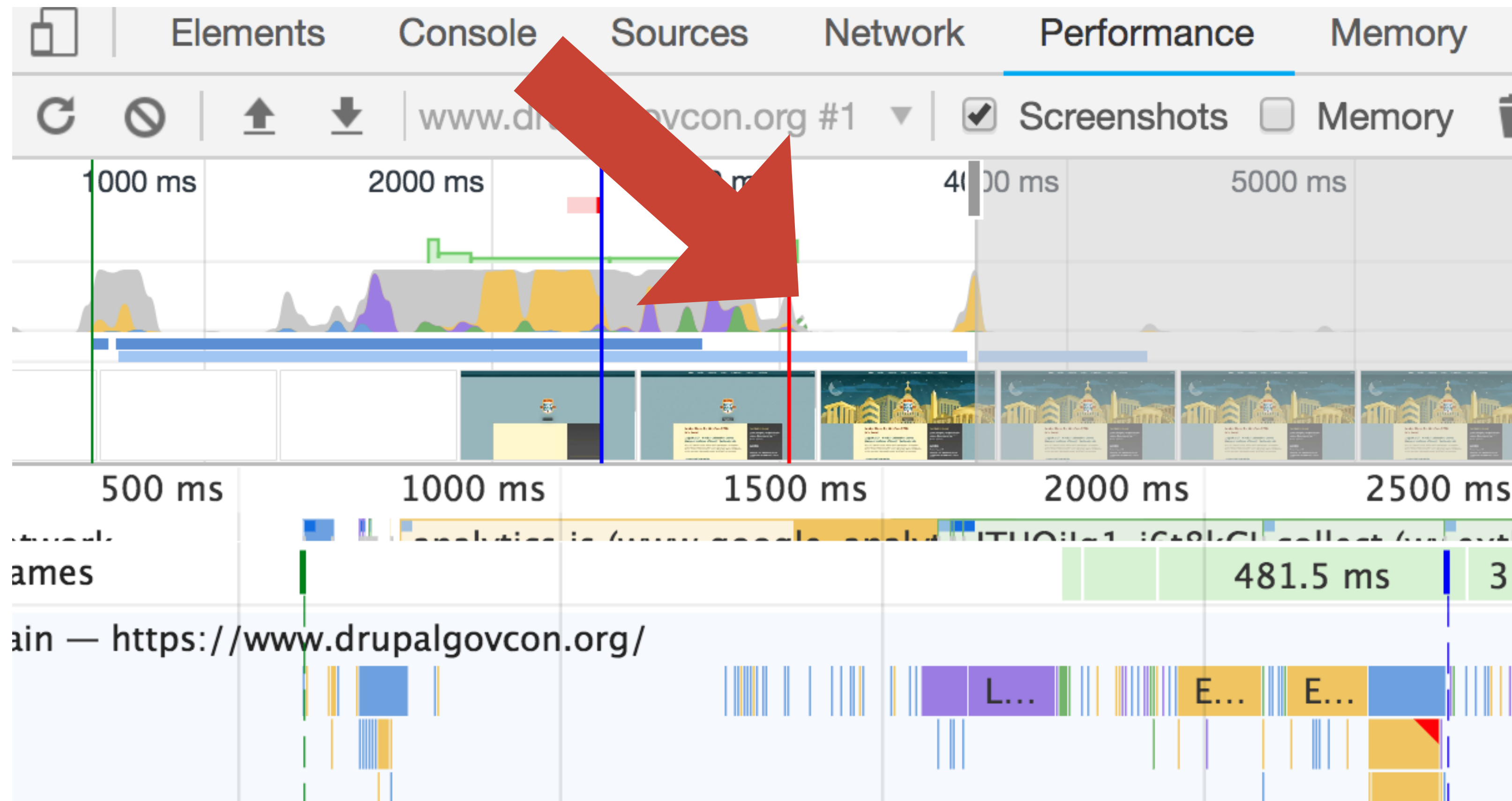
TIME TO FIRST MEANINGFUL PAINT



TIME TO INTERACTIVE

- ▶ Load is finished, and main thread work is done
- ▶ Consistently interactive

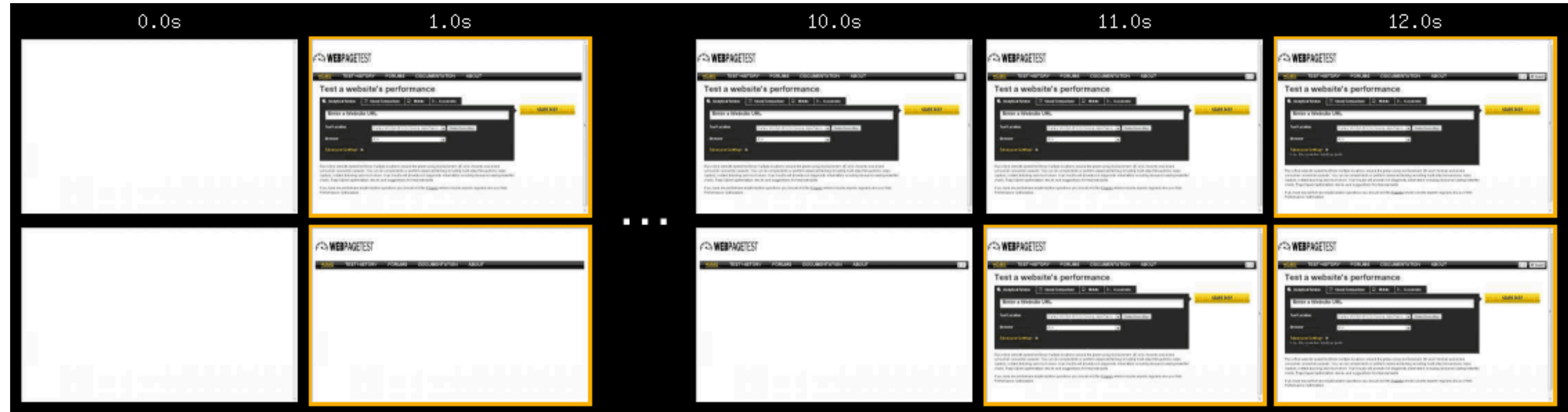
TIME TO INTERACTIVE



SPEED INDEX

- ▶ Calculated value
- ▶ Average time at which visible parts of the page are displayed
- ▶ How quickly does the page approach visually complete?
- ▶ Essentially the time it takes for average pixel to paint (milliseconds)

SPEED INDEX



SPEED INDEX

Performance

Metrics

First Contentful Paint 340 ms 

Speed Index 2,650 ms 

Time to Interactive Error!

[View Trace](#)



A detailed technical drawing of a mechanical device, possibly a printer or a similar machine, rendered in a reddish-orange color. The drawing shows a complex internal structure with various components labeled. Labels include: 'Tree shaker' at the top left; 'First meaningful paint' on the left side; 'Render blocker' in the middle; 'Edge side include' on the right side; 'Lazy loader' below it; 'V8 Engine' further down; 'Module mapper' at the bottom left; 'JavaScript parser' at the bottom right; and 'Module' at the far right. The drawing is a cross-section, showing the internal gears, rollers, and structural elements of the machine.

HOW BROWSERS WORK: NETWORK DOWNLOAD

1. Download index file
2. Parse index file as it is downloading
3. Prioritize critical content



Asset prioritization

HTTP

Resource hint

DOM nodes

Render Tree

HOW BROWSERS WORK: PRIORITIZING CONTENT

1. Highest

- ▶ Initial document
- ▶ CSS

2. High

- ▶ Webfonts
- ▶ Script tags in the `<head>`
- ▶ XHR

3. Medium

- ▶ Script tags outside of the `<head>`

4. Low

- ▶ Images

DevTools - www.lullabot.com/

Console Elements Network Sources Audits Layers Performance Application Security >> 1

View: [List Icon] [Tree Icon] [Checkmark] Group by frame | Preserve log Disable cache | Offline Online

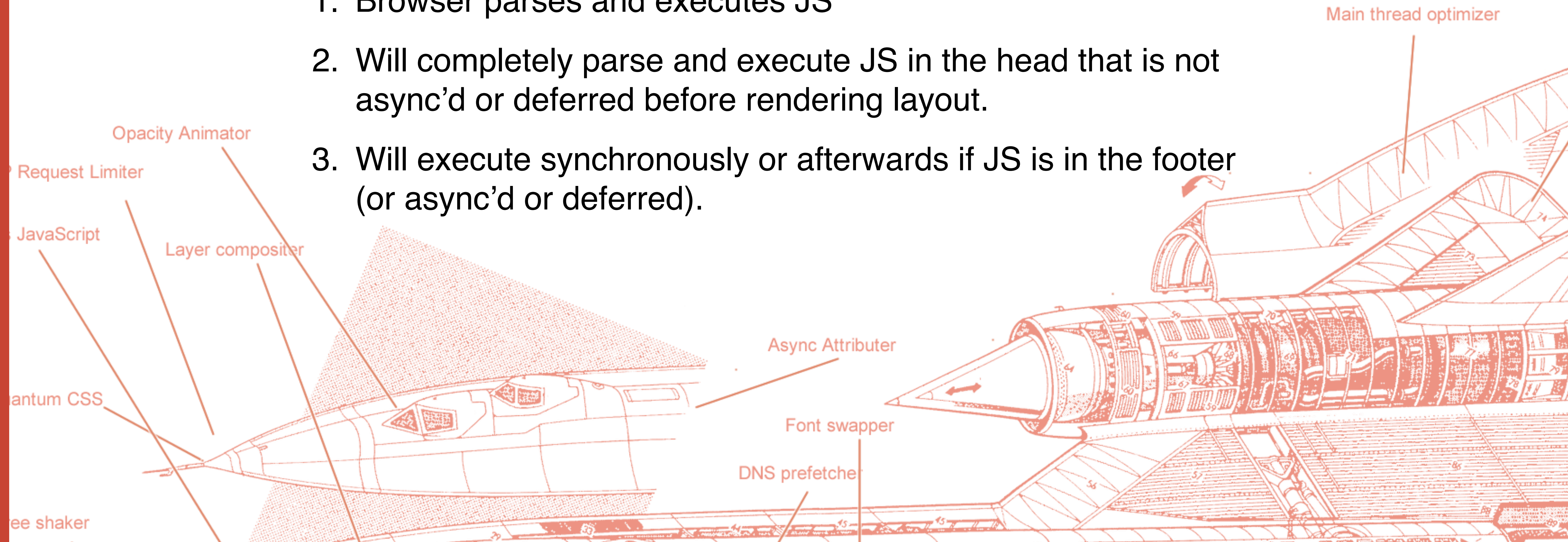
Filter Hide data URLs **All** XHR JS CSS Img Media Font Doc WS Manifest Other

Name	Status	Pr...	Domain	Type	Size	Priority	Waterfall
www.lullabot.com	200 OK	ht...	www.lullabot.com	docum...	78... 349...	Highest	
main.a216eb97.js /static/js	200 OK	ht...	www.lullabot.com	script	230... 101...	High	
FreightTextProBo... /fonts	200 OK	ht...	www.lullabot.com	font	28... 27.9...	Highest	
FreightSansProB... /fonts	200 OK	ht...	www.lullabot.com	font	24... 24...	Highest	
FreightTextProLi... /fonts	200 OK	ht...	www.lullabot.com	font	17.8... 17.3...	Highest	
FreightTextProBo... /fonts	200 OK	ht...	www.lullabot.com	font	30... 29...	Highest	
FreightTextProBo... /fonts	200 OK	ht...	www.lullabot.com	font	27.2... 26...	Highest	
FreightSansProB... /fonts	200 OK	ht...	www.lullabot.com	font	24... 23...	Highest	
oliver-thomas-kl... assets.lullabot.c...	200 OK	ht...	assets.lullabot.com	jpeg	119 ... 119 ...	Low	
wes-fave-css-h... assets.lullabot.c...	200 OK	ht...	assets.lullabot.com	jpeg	31.8... 31.5...	Low	

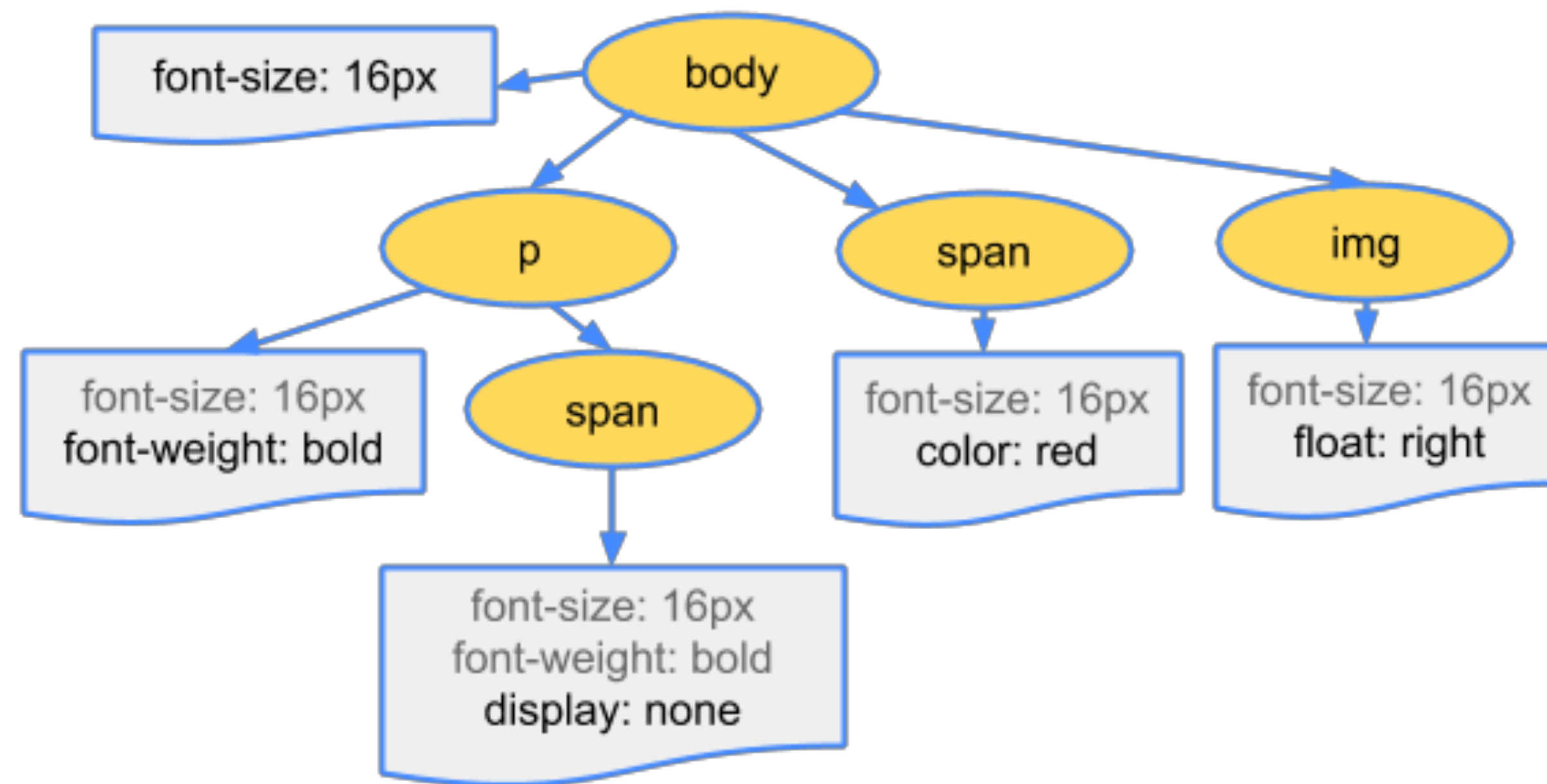
31 requests | 3.0 MB transferred | Finish: 5.95 s | **DOMContentLoaded: 1.31 s** | **Load: 5.97 s**

HOW BROWSERS WORK: PARSE / EXECUTE CSS & JS

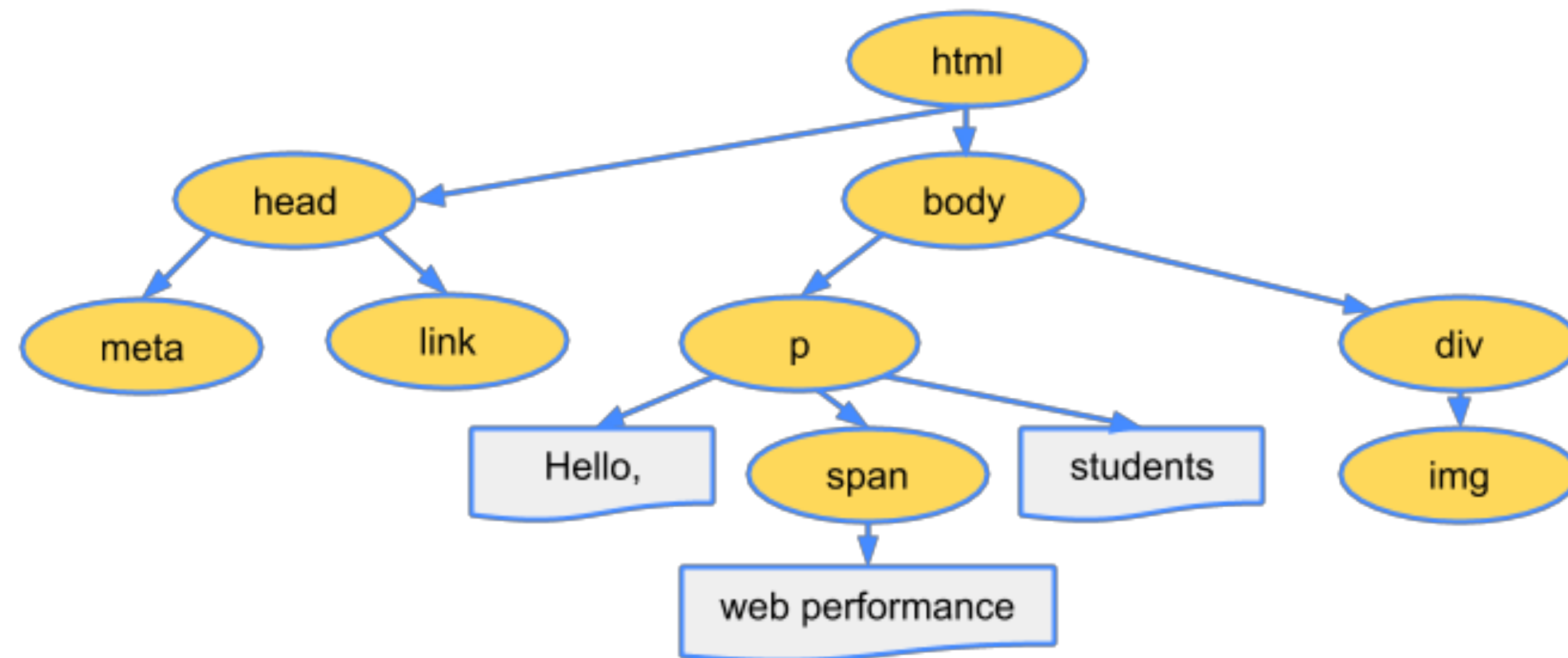
1. Browser parses and executes JS
2. Will completely parse and execute JS in the head that is not async'd or deferred before rendering layout.
3. Will execute synchronously or afterwards if JS is in the footer (or async'd or deferred).



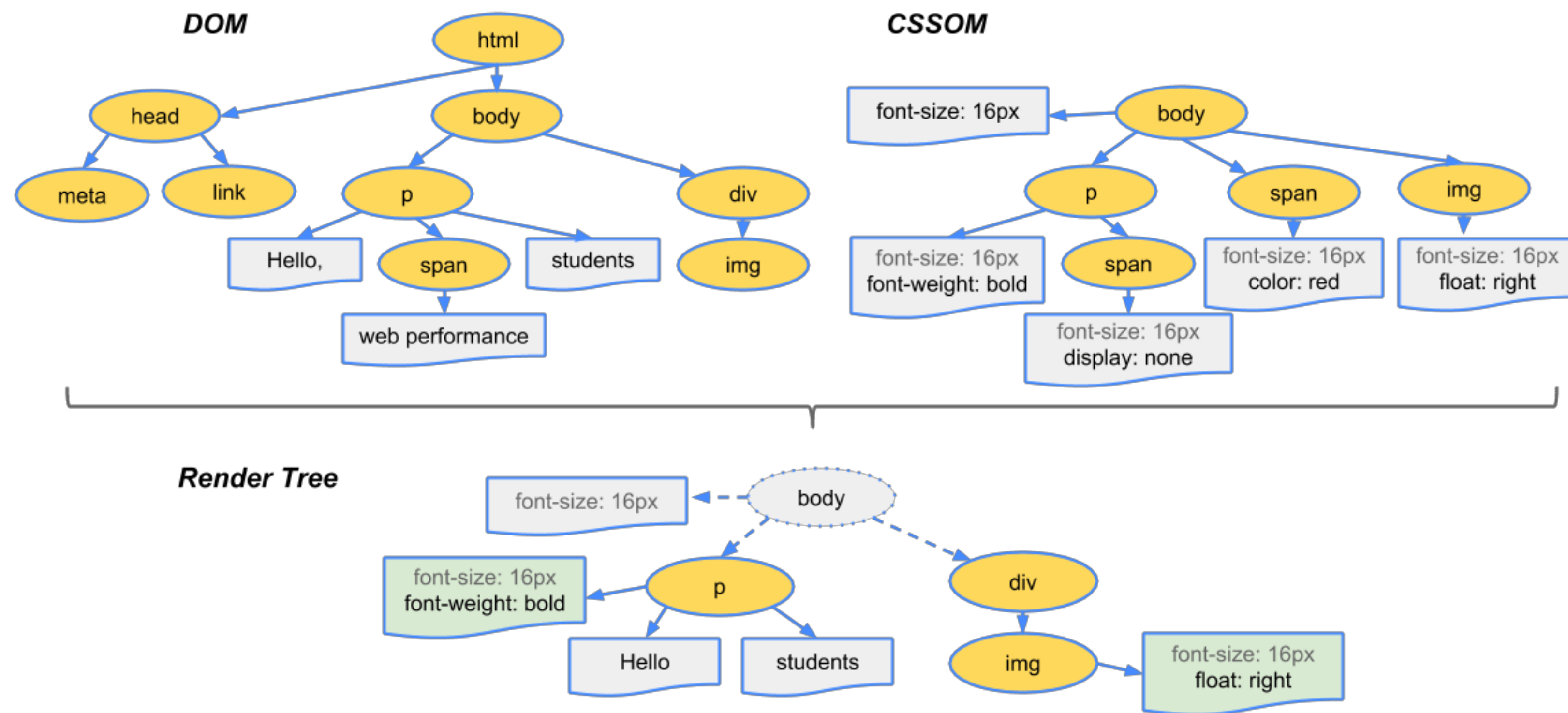
HOW BROWSERS WORK: CREATING THE CSSOM



HOW BROWSERS WORK: CREATING THE DOM

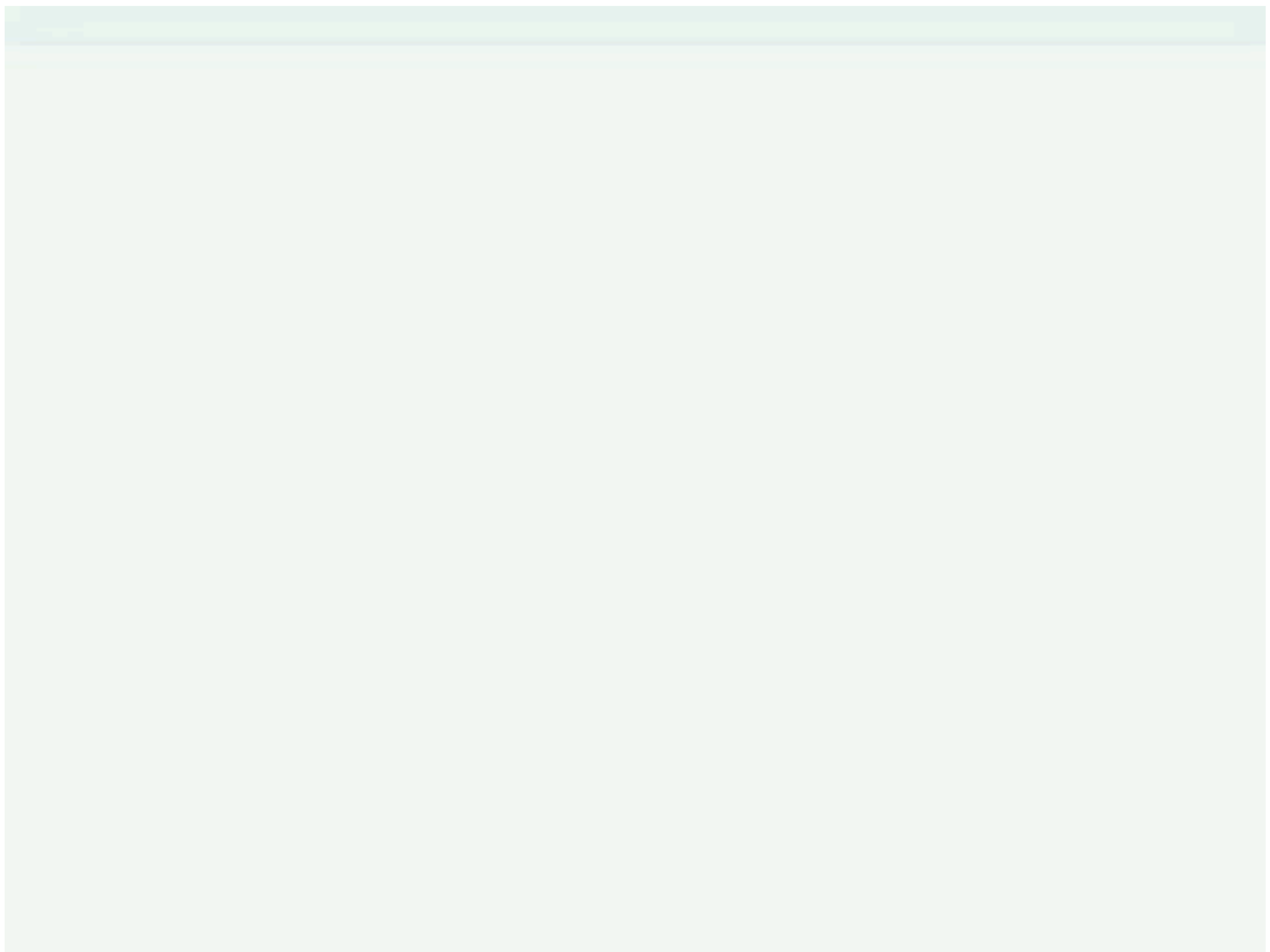


HOW BROWSERS WORK: CREATING THE RENDER TREE



LAYOUT (AKA REFLOW)

- ▶ Browser calculates how much space it takes to put elements on screen.
- ▶ Calculates where to place the elements on the screen in relation to other elements and the viewport.
- ▶ Expensive.



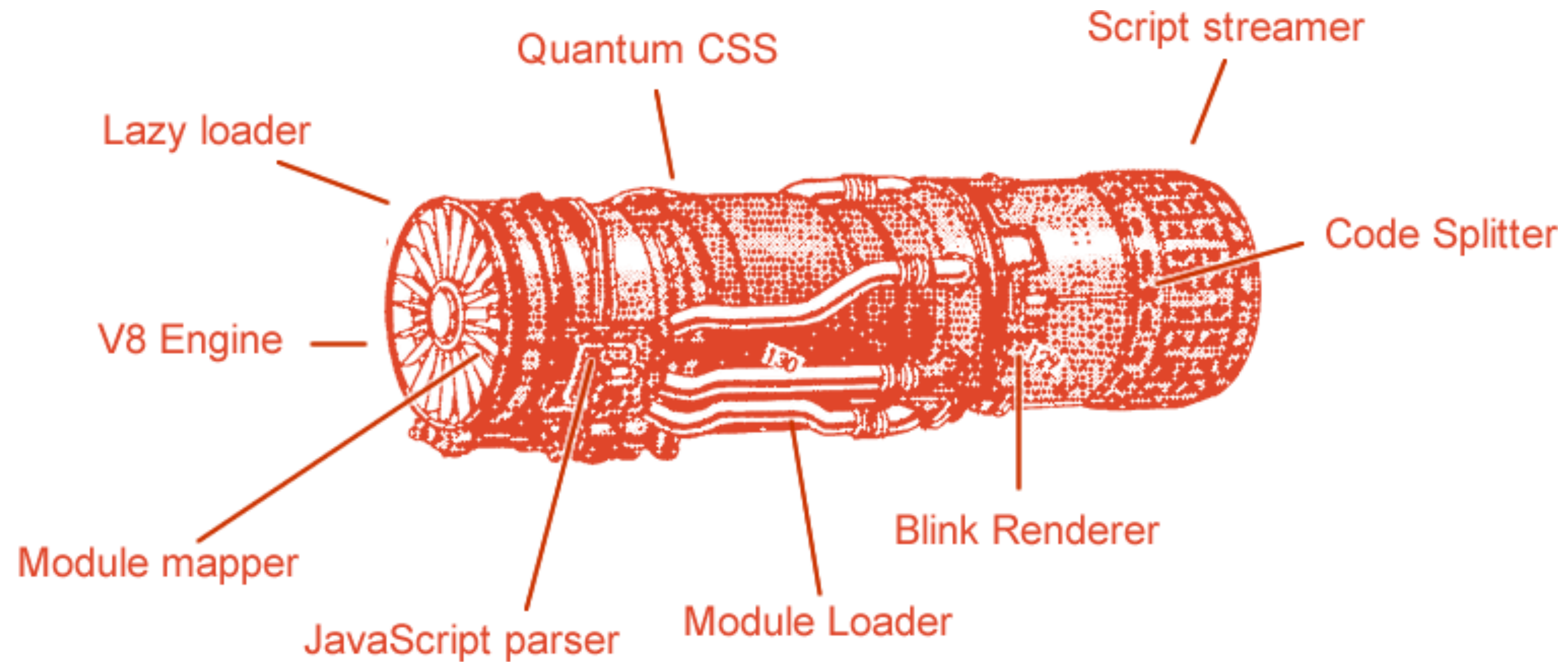
PAINT

- ▶ The process of filling in pixels.
- ▶ Text, colors, images, borders, etc
- ▶ Expensive.

COMPOSITING

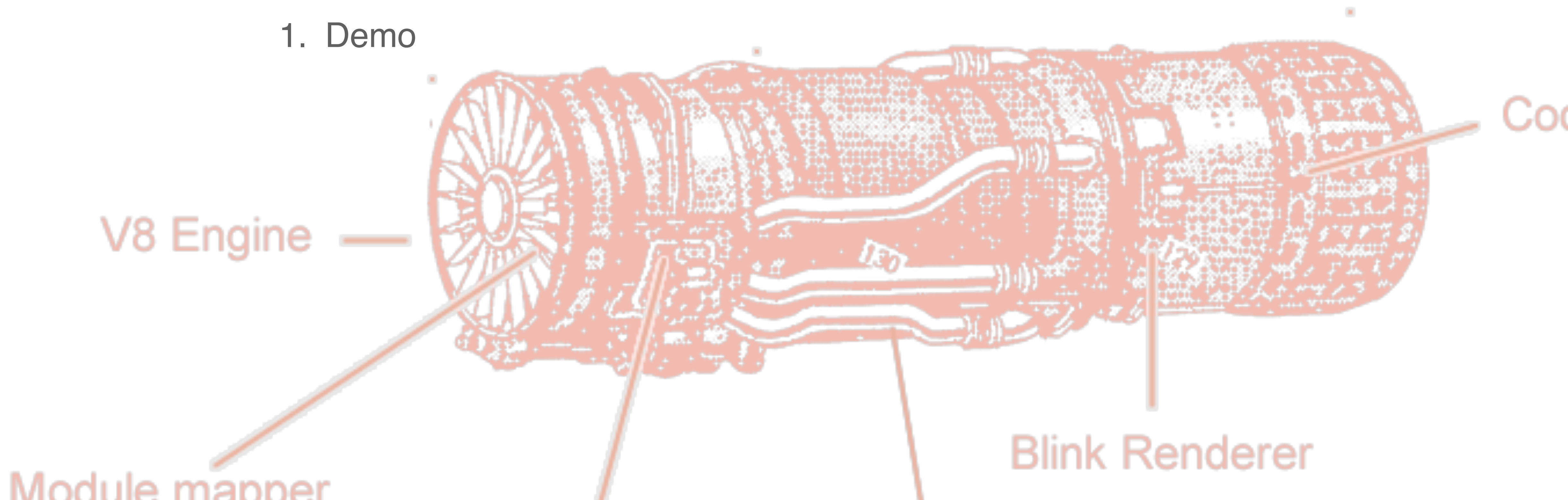
- ▶ Multiple layers within browser get placed on the screen.
- ▶ Think of these as Photoshop layers - they can easily be moved around
- ▶ Cheap!

MEASURING PERFORMANCE



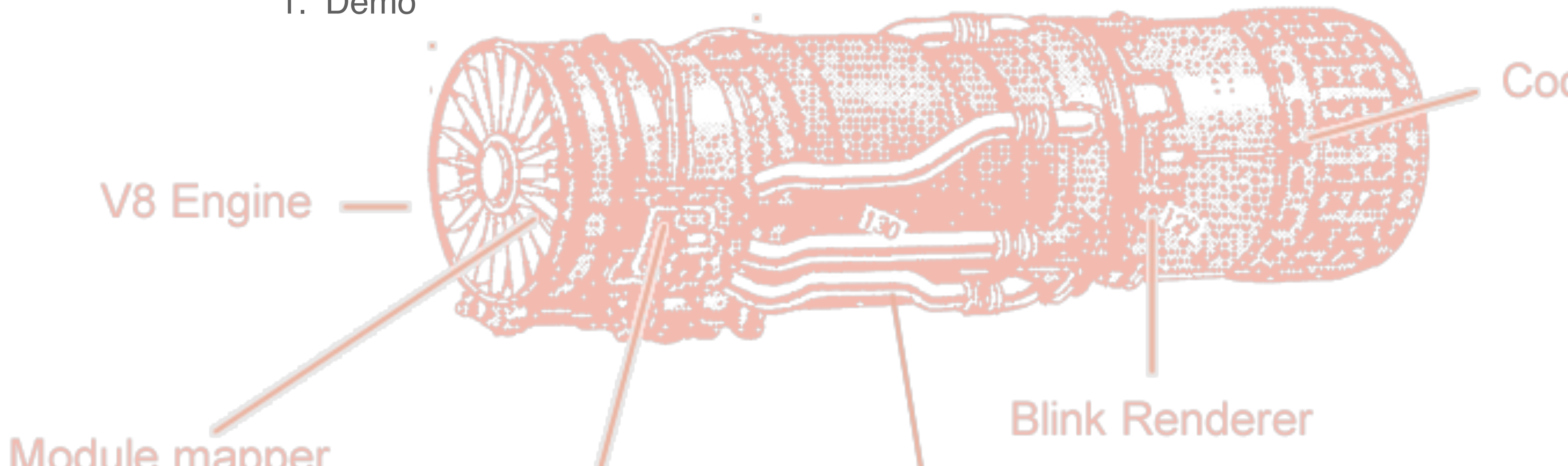
MEASURING PERF: DEVTOOLS AUDITS TAB

1. Demo



MEASURING PERF: DEVTOOLS PERFORMANCE

1. Demo



OPTIMIZATIONS



OPTIMIZATIONS: NETWORK DOWNLOAD









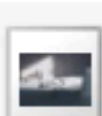

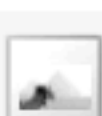
- ▶ Use less bandwidth
- ▶ Limit the use of large images
- ▶ Use responsive images
- ▶ Limit network requests
 - ▶ Especially if you're not using HTTP/2 (aka h2)

DevTools - www.lullabot.com/

Console Elements Network Sources Audits Layers Performance Application Security Memory React 1

View: [List View] [Group by frame] [Preserve log] [Disable cache] [Offline] [Online]

Filter [] Hide data URLs [All] XHR JS CSS Img Media Font Doc WS Manifest Other

Name	Status	Proto...	Domain	Type	Size	Priority	Waterfall
 www.lullabot.com	200 OK	http/1.1	www.lullabot.com	document	78.3 KB 349 KB	Highest	
 main.a216eb97.js /static/js	200 OK	http/1.1	www.lullabot.com	script	230 KB 1015 KB	High	
 FreightTextProBook.woff2 /fonts	200 OK	http/1.1	www.lullabot.com	font	28.3 KB 27.9 KB	Highest	
 FreightSansProBold.woff2 /fonts	200 OK	http/1.1	www.lullabot.com	font	24.8 KB 24.3 KB	Highest	
 FreightTextProLightItalic.woff2 /fonts	200 OK	http/1.1	www.lullabot.com	font	17.8 KB 17.3 KB	Highest	
 FreightTextProBookItalic.woff2 /fonts	200 OK	http/1.1	www.lullabot.com	font	30.3 KB 29.9 KB	Highest	
 FreightTextProBookLight.woff2 /fonts	200 OK	http/1.1	www.lullabot.com	font	27.2 KB 26.8 KB	Highest	
 FreightSansProBook.woff2 /fonts	200 OK	http/1.1	www.lullabot.com	font	24.3 KB 23.9 KB	Highest	
 oliver-thomas-klein-144899.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com	jpeg	119 KB 119 KB	Low	
 wes-fave-css-hero.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com	jpeg	31.8 KB 31.5 KB	Low	
 ricardo-gomez-angel-365492-u... assets.lullabot.com/stvles/dvna...	200 OK	http/1.1	assets.lullabot.com	jpeg	202 KB 202 KB	Low	

61 requests | 6.8 MB transferred | Finish: 54.2 min | DOMContentLoaded: 1.31 s | Load: 5.97 s

PRPL PATTERN

- ▶ **Push** critical resources for the initial URL route.
- ▶ **Render** initial route.
- ▶ **Pre-cache** remaining routes.
- ▶ **Lazy-load** and create remaining routes on demand.



OPTIMIZATIONS: NETWORK DOWNLOAD

- ▶ Use less bandwidth
- ▶ Limit the use of large images
- ▶ Use responsive images
- ▶ Limit network requests
 - ▶ Especially if you're not using HTTP/2 (aka h2)

Console Elements **Network** Sources Audits Layers Performance Application Security Memory ⚠ 3

| | View: Group by frame | Preserve log | Disable cache | Offline Online ▼

Filter Hide data URLs **All** | XHR JS CSS Img Media Font Doc WS Manifest Other

Recording network activity...

Perform a request or hit **⌘ R** to record the reload.

Console Elements **Network** Sources Audits Layers Performance Application Security Memory React ✖ 1

View: Group by frame | Preserve log | Disable cache | Offline Online

Filter Hide data URLs **All** | XHR JS CSS Img Media Font Doc WS Manifest Other

Recording network activity...

Perform a request or hit **⌘ R** to record the reload.

DevTools - www.syfy.com/

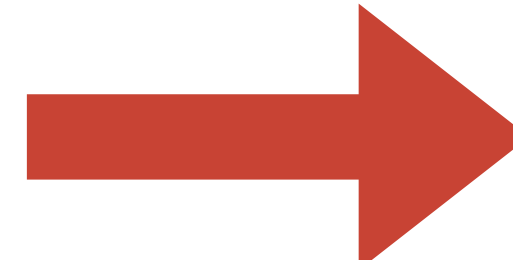
Console Elements Network Sources Audits Layers Performance Application Security Memory >> 2 23

View: [List Icon] [Tree Icon] [Checkmark] Group by frame [Uncheck] Preserve log [Checkmark] Disable cache [Uncheck] Offline Online

Filter [] Hide data URLs [All] XHR JS CSS Img Media Font Doc WS Manifest Other

Name	Stat...	Protocol	Do...	Type	Size	Priority	Waterfall
www.syfy.com	200 OK	http/1.1	ww...	docum...	51... 26...	Highest	[Bar]
SYFY_Hero-Regular.w... /sites/syfy/themes/wir...	200 OK	http/1.1	ww...	font	18... 18...	High	[Bar]
SYFY_Sidekick-Regul... /sites/syfy/themes/wir...	200 OK	http/1.1	ww...	font	17... 17.1...	High	[Bar]
GT-Cinetype-Syfy-Lig... /sites/syfy/themes/wir...	200 OK	http/1.1	ww...	font	35... 35...	High	[Bar]
fonts.css /sites/syfy/themes/wir...	200 OK	http/1.1	ww...	styles...	83... 2.8...	Highest	[Bar]
css_2VWmjUt59_T44... /sites/syfy/files/css	200 OK	http/1.1	ww...	styles...	4.1 ... 18...	Highest	[Bar]
css_XW3gNESJAY-c... /sites/syfy/files/css	200 OK	http/1.1	ww...	styles...	2.8... 8.2...	Highest	[Bar]
css_DJZUQV8aF7QE... /sites/syfy/files/css	200 OK	http/1.1	ww...	styles...	1.1 ... 1.8 ...	Highest	[Bar]
css_rHwRbYMQjmOp... /sites/syfy/files/css	200 OK	http/1.1	ww...	styles...	90... 81...	Highest	[Bar]
js_1S3DvBE0uhZ-Vbv... /sites/syfy/files/js	200 OK	http/1.1	ww...	script	76... 36...	High	[Bar]
js_pREQwMBF3pMD3... /sites/syfy/files/js	200 OK	http/1.1	ww...	script	49... 12...	High	[Bar]

356 requests | 7.1 MB transferred | Finish: 1.2 min | [DOMContentLoaded: 3.51 s](#) | [Load: 15.83 s](#)

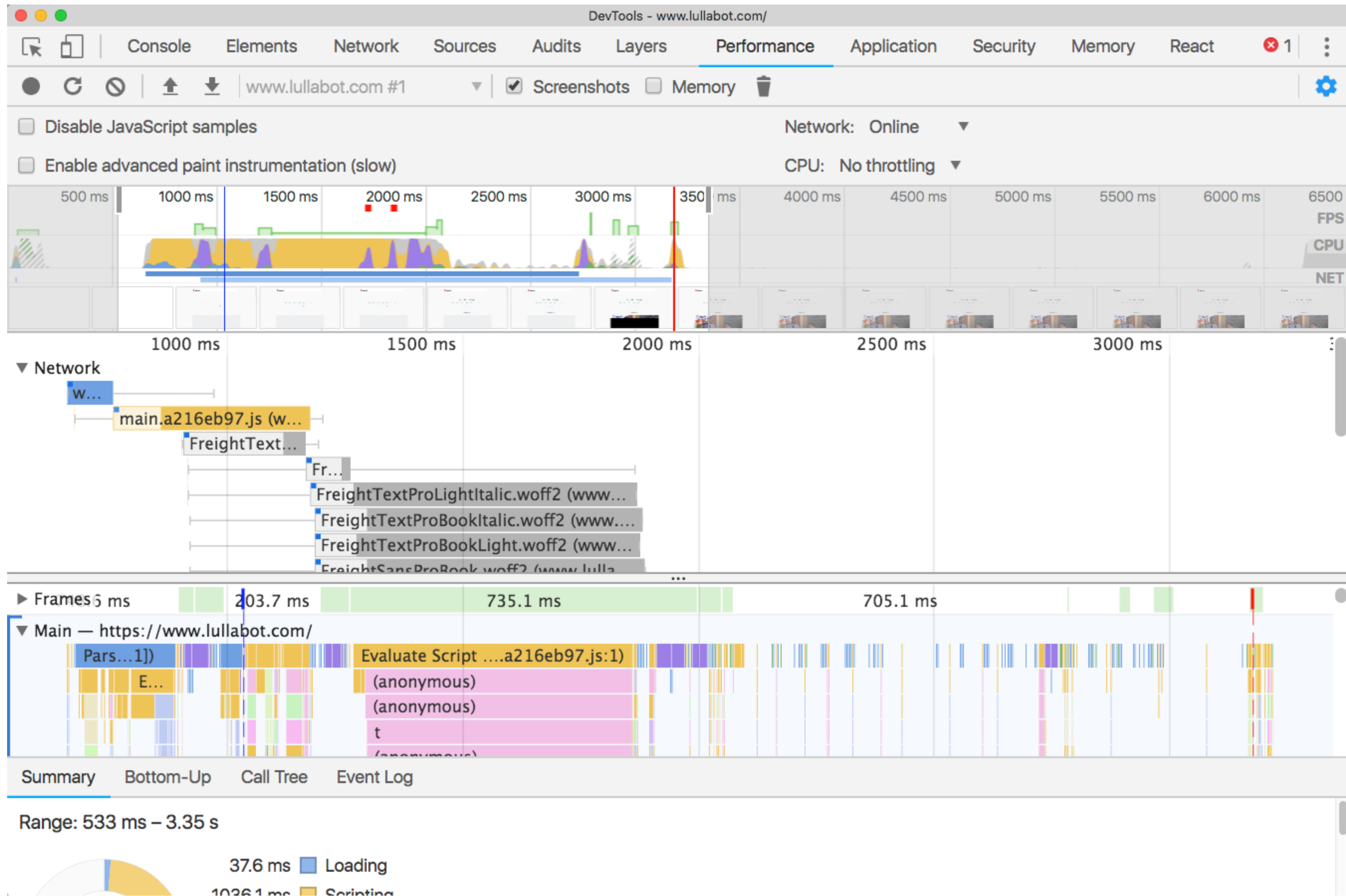


RESOURCE HINTS

- ▶ Link tags inserted in <HEAD> that tell the browser to reach out and download or connect to resources
 - ▶ `<link rel='preload' ...`
 - ▶ `<link rel='dns-prefetch' ...`
 - ▶ `<link rel='preconnect' ...`

PRELOAD IN ACTION

```
1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5   <meta charset="utf-8">
6   <meta name="viewport" content="width=device-width,initial-scale=1,shrink-to-fit=no">
7   <meta name="theme-color" content="#000000">
8   <link rel="manifest" href="/manifest.json">
9   <link rel="icon" type="image/png" href="/favicon.png" />
10  <title>Lullabot</title>
11  <link href="https://api.lullabot.com" rel="preconnect" crossorigin>
12  <link href="https://assets.lullabot.com" rel="preconnect" crossorigin>
13  <link rel="preload" href="/static/js/main.a216eb97.js" as="script" />
14  <style type="text/css">
15    @font-face {
16      font-family: 'FreightTextPro';
17      font-weight: 300;
18      font-style: normal;
19      src: url('/fonts/FreightTextProBookLight.woff2') format('woff2'), url('/fonts/FreightTextProBookLight.woff') format('woff')
20    }
21
22    @font-face {
23      font-family: 'FreightTextPro';
```



PRECONNECT IN ACTION

```
1 <!DOCTYPE html>
2 <html lang="en">
3
4 <head>
5   <meta charset="utf-8">
6   <meta name="viewport" content="width=device-width,initial-scale=1,shrink-to-fit=no">
7   <meta name="theme-color" content="#000000">
8   <link rel="manifest" href="/manifest.json">
9   <link rel="icon" type="image/png" href="/favicon.png" />
10  <title>Lullabot</title>
11  <link href="https://api.lullabot.com" rel="preconnect" crossorigin>
12  <link href="https://assets.lullabot.com" rel="preconnect" crossorigin>
13  <link rel="preload" href="/static/js/main.216cb07.js" as="script" />
14  <style type="text/css">
15    @font-face {
16      font-family: 'FreightTextPro';
17      font-weight: 300;
18      font-style: normal;
19      src: url('/fonts/FreightTextProBookLight.woff2') format('woff2'), url('/fonts/FreightTextProBookLight.woff') format('woff')
20    }
21
22    @font-face {
23      font-family: 'FreightTextPro';
24      font-weight: 300;
25      font-style: italic;
26      src: url('/fonts/FreightTextProLightItalic.woff2') format('woff2'), url('/fonts/FreightTextProLightItalic.woff') format('wo
```

DevTools - www.lullabot.com/

Console Elements **Network** Sources Audits Layers Performance Application Security Memory React 1

View: [List Icon] [Tree Icon] [Filter Icon] Group by frame [] Preserve log [x] Disable cache [] Offline Online

domain:assets.lullabot.com [] Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other

Search headers and response bodies for domain:assets.lullabot.com Find All

Name	Status	Proto...	Domain	Type	Size	Priority	Waterfall
william-bout-264826.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com	jpeg	238 KB 237 KB	Low	
oliver-thomas-klein-144899.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
lightning-sky-storm-53459.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
wes-fave-css-hero.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
img_1600g.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
hero-david-pisnoy-545993-uns... assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
syfy_the-expanse_promo-image... assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
hero_nyu-langone.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				
hero_b2x_0.jpg assets.lullabot.com/styles/dyna...	200 OK	http/1.1	assets.lullabot.com				

Queued at 877.64 ms
Started at 886.41 ms

Resource Scheduling

Queueing | TIME 8.77 ms

Connection Start | TIME

Stalled | 10.19 ms

DNS Lookup | 152.12 ms

Initial connection | 161.55 ms

SSL | 113.51 ms

Request/response | TIME

Request sent | 0.12 ms

Waiting (TTFB) | 45.65 ms

Content Download | 661.81 ms

[Explanation](#) | 1.05 s

9 / 29 requests | 2.2 MB / 2.7 MB transferred | Finish: 3.12 s | DOMContentLoaded: 987 ms | Load: 3.13 s

DevTools - www.lullabot.com/

Console Elements Network Sources Audits Layers Performance Application Security Memory React

View: [Icons] Group by frame [] Preserve log [x] Disable cache [] Offline Online

domain:api.lullabot.com [] Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other

Search headers and response body for domain:api.lullabot.com Find All

Name	Proto...	Domain	Type	Size	Priority	Waterfall
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com	fetch	402 B 0 B	High	
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	http/1.1	api.lullabot.com				
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	204 No Content	http/1.1	api.lullabot.com	fetch	401 B 0 B	High
<input type="checkbox"/> _all_docs?include_docs=true api.lullabot.com/lullabot	200 OK	http/1.1	api.lullabot.com	text/plain	1.0 KB 831 B	High

Queued at 1.76 s
Started at 1.76 s

Resource Scheduling	TIME
Queueing	0.73 ms
Connection Start	TIME
Stalled	2.74 ms
Request/Response	TIME
Request sent	0.13 ms
Waiting (TTFB)	45.80 ms
Content Download	162.67 ms
Explanation	212.08 ms

10 / 29 requests | 12.7 KB / 2.7 MB transferred | Finish: 3.12 s | DOMContentLoaded: 987 ms | Load: 3.13 s

ALL TOGETHER NOW...

```
<!DOCTYPE html>
<html lang="en" dir="ltr">

<head>
  <meta name="viewport" content="initial-scale=1.0,width=device-width">
  <meta name="theme-color" content="#eecf1e">
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_3_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_2_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_4_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic/360074_1_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/tablet_gothic_condensed/360074_5_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/fonts/adelle/360074_0_0.woff2" as="font" type="font/woff2" crossorigin>
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary--small.jpg" as="image" media="(max-width: 640px)">
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary--med.jpg" as="image" media="(min-width: 640px) and (max-width: 980px)">
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary--med-large.jpg" as="image" media="(min-width: 980px) and (max-width: 1200px)">
  <link rel="preload" href="/sites/all/themes/zeus/images/new-design/homepage/hero-image-primary.jpg" as="image" media="(min-width: 1200px)">
  <link rel="preconnect" href="https://fonts.googleapis.com">
  <link rel="preconnect" href="https://app-ab05.marketo.com">
  <link rel="preconnect" href="https://cdnjs.cloudflare.com">
  <link rel="preconnect" href="https://cdn.optimizely.com">
  <link rel="preconnect" href="https://logx.optimizely.com">
  <link rel="preconnect" href="https://static.olark.com">
  <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
  <script type="text/javascript">
    window.NREUM || (NREUM = {}), __nr_require = function (e, t, n) {
      function r(n) {
        if (!t[n]) {
          var o = t[n] = {
            exports: {}
          };
          e[n][0].call(o.exports, function (t) {
            var o = e[n][1][t];
          });
        }
      }
    }
  </script>
</head>
</html>
```


START USING TODAY!

Resource Hints: preload - CR

Usage
Global

% of all users

68.82% + 1.47% = 70.29%

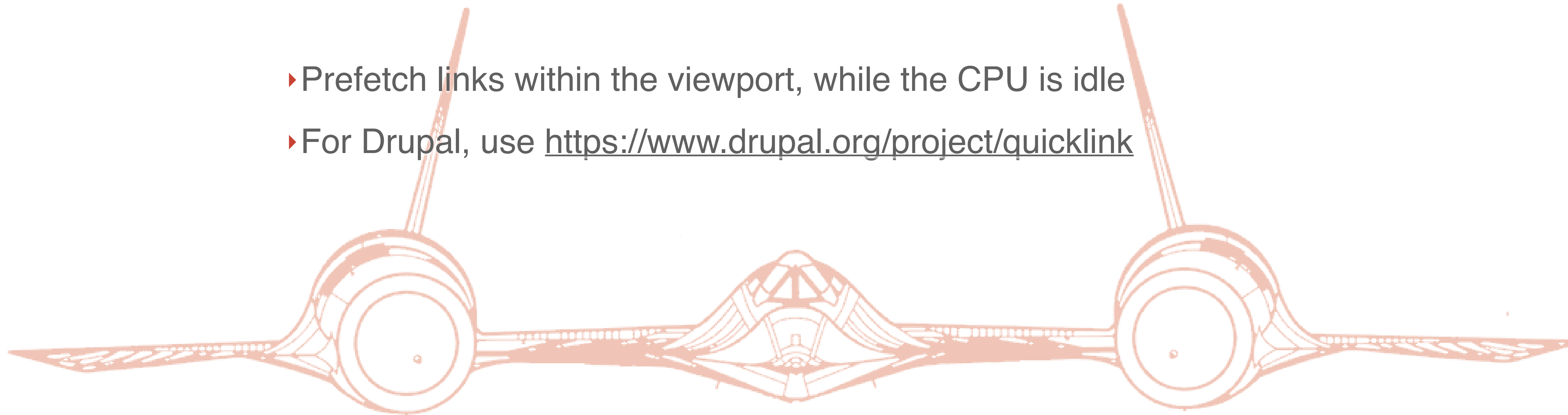
Using `<link rel="preload">`, browsers can be informed to prefetch resources without having to execute them, allowing fine-grained control over when and how resources are loaded.

Current aligned Usage relative Date relative Show all

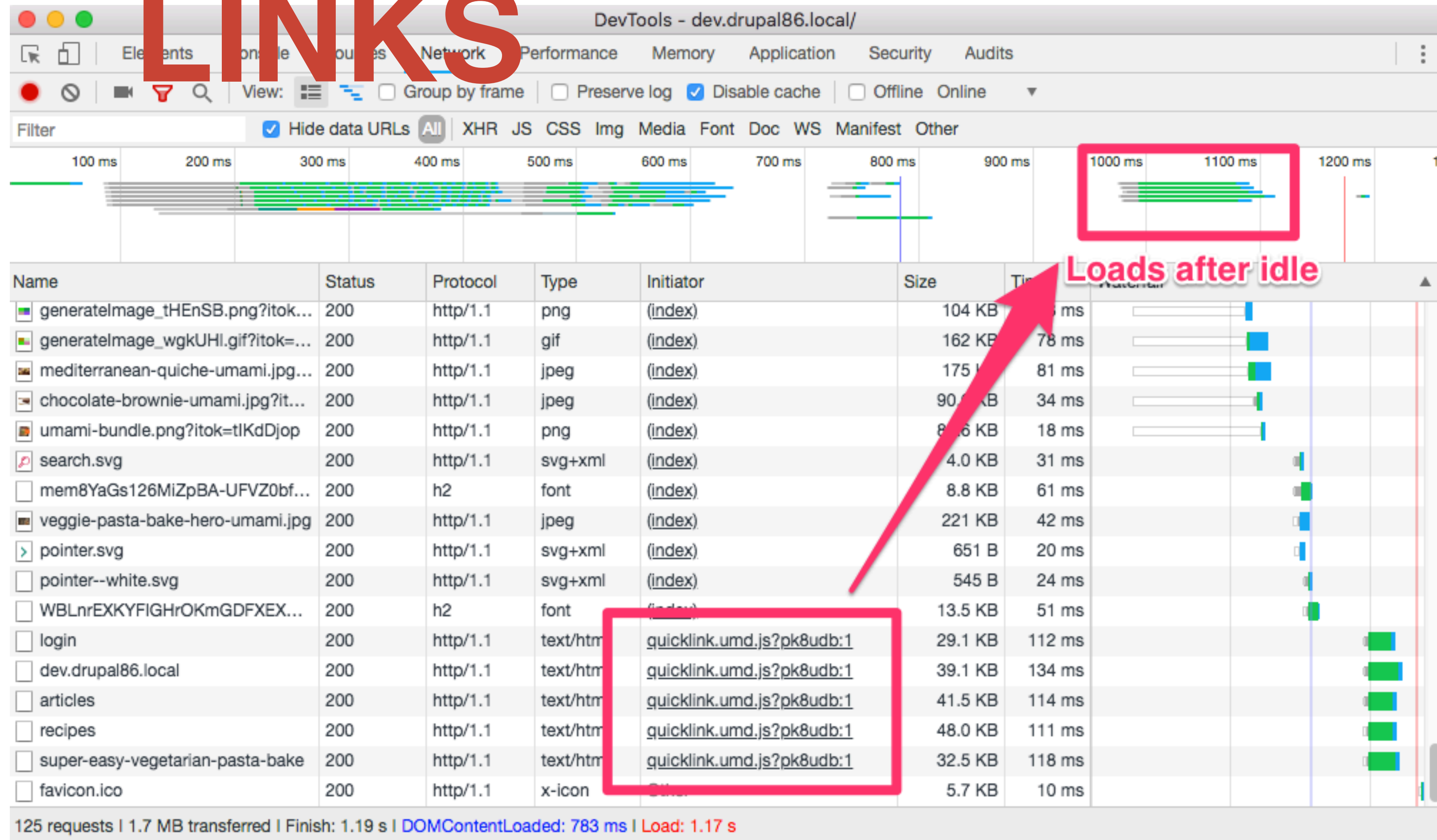
IE	Edge *	Firefox	Chrome	Safari	iOS Safari *	Opera Mini *	Chrome for Android	UC Browser for Android	Samsung Internet
			49						
			63						
			66		10.3				
			67		11.2				4
11	17	61	68	11.1	11.4	all	67	11.8	7.2
	18	62	69	12	12				
		63	70	TP					
			71						

PREFETCH

- ▶ Prefetch links within the viewport, while the CPU is idle
- ▶ For Drupal, use <https://www.drupal.org/project/quicklink>



PREFETCHING LINKS



LINKS ENTERING VIEWPORT

The image shows a web browser displaying the Lullabot website. The browser's address bar shows the URL `https://www.lullabot.com`. The website header includes the Lullabot logo and a navigation menu with links for WORK, SERVICES, ABOUT, BLOG, PODCASTS, and CONTACT. The main content area features the text "Hi, we're Lullabot." Below the browser window, the developer tools are open to the Network tab. The Network tab shows a list of requests with columns for Status, Method, Domain, File, Cause, Type, Transferred, Size, and Timeline. The list is currently empty, and a message at the bottom of the Network panel reads "No requests".

Inspector Console Debugger Style Editor Performance **Network** Storage Accessibility Memory

Filter URLs | All **HTML** CSS JS XHR Fonts Images Media WS Other Persist Logs Disable cache No throttling HAR

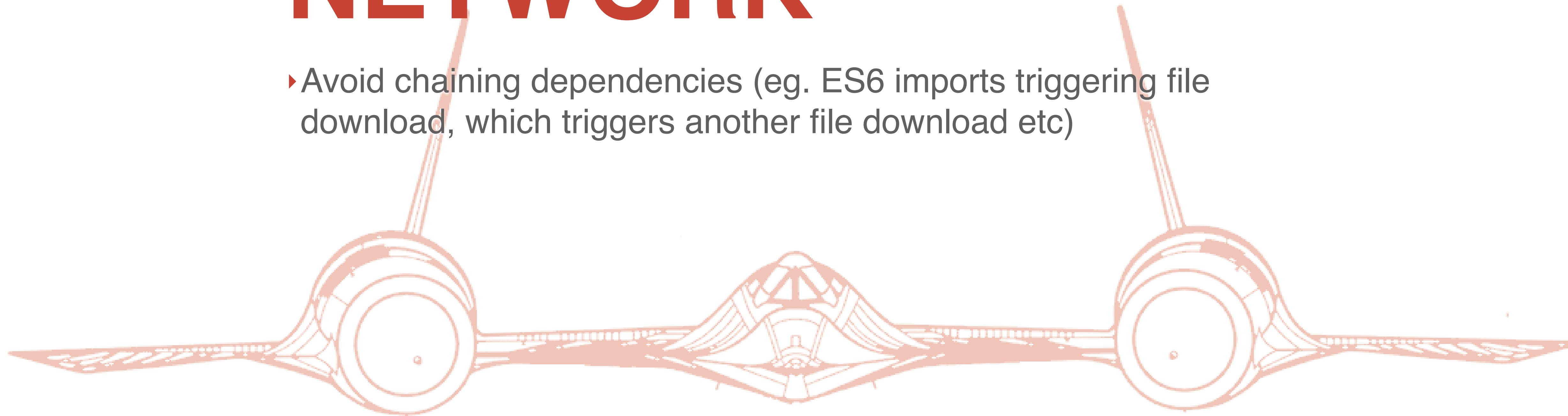
Status	Method	Domain	File	Cause	Type	Transferred	Size	Timeline
--------	--------	--------	------	-------	------	-------------	------	----------

- Perform a request or **Reload** the page to see detailed information about network activity.
- Click on the button to start performance analysis. [?](#)

No requests

OPTIMIZATIONS: NETWORK

- ▶ Avoid chaining dependencies (eg. ES6 imports triggering file download, which triggers another file download etc)



DevTools - www.lullabot.com/

Elements Console Sources Network Performance Memory Application Security Audits

www.lullabot.com #1 | Screenshots Memory

Disable JavaScript samples Network: Online
 Enable advanced paint instrumentation (slow) CPU: No throttling

500 ms 1000 ms 1500 ms 2000 ms 2500 ms 3000 ms 3500 ms 4000 ms 4500 ms

FPS
CPU
NET

1600 ms 1700 ms 1800 ms 1900 ms 2000 ms 2100 ms 2200 ms

▼ Network

- _all_doc...
- _all_docs (api.lullabot.com)
- _all_docs...
- _all_do...
- _all_docs (api...
- _all_doc...
- _all_do...
- wes-fave-css-her
- syfy_the-expans
- hero_nyu-langon

...

Frames ms

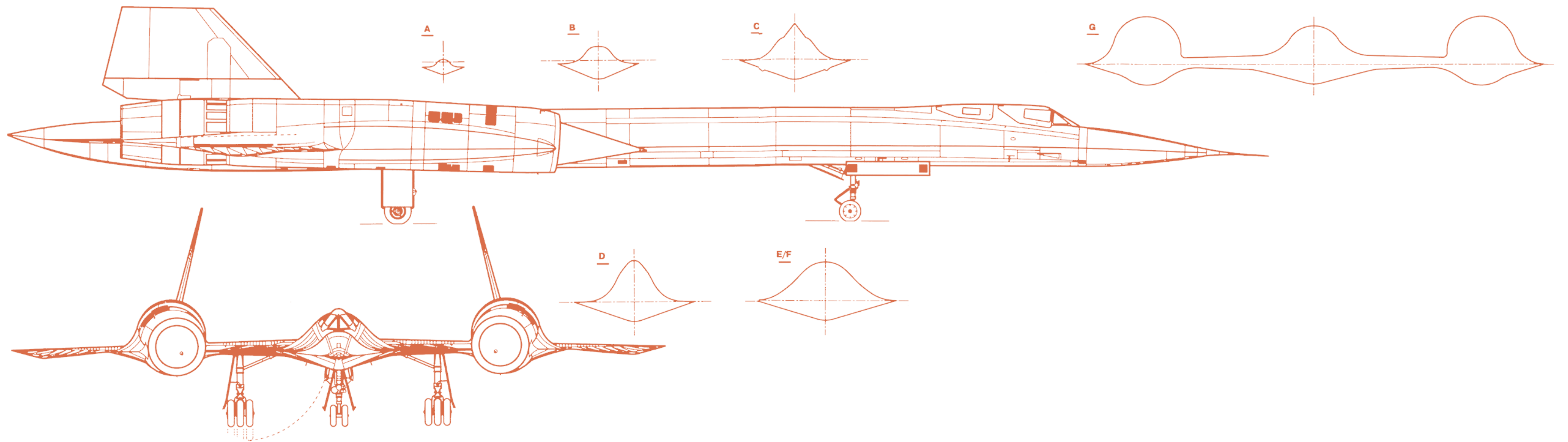
- Main — https://www.lullabot.com/ 525.8 ms
- Raster
- GPU

Summary Bottom-Up Call Tree Event Log

Range: 1.51 s – 2.22 s

- 0.1 ms Loading
- 17.2 ms Scripting
- 88.9 ms Rendering

OPTIMIZATIONS: RENDERING





WHAT IS THE CRITICAL PATH?

- ▶ Anything and everything that prevents the webpage from rendering
 - ◻ HTML
 - ▶ CSS in the head
 - ▶ JavaScript in the head
 - ▶ Fonts!
- ▶ You want to minimize everything that is in the critical path.



CRITICAL PATH CSS

- ▶ What is this?
 - ▶ Load CSS that is used to render the initial viewport (“above the fold”) inline within a `<style>` tag
 - ▶ Load remaining CSS before each component (with the `<body>` tag).
- ▶ Browser will parse the initial styles in the head, and immediately render document
- ▶ The browser will then parse and interpret the CSS in the body as it finds it.



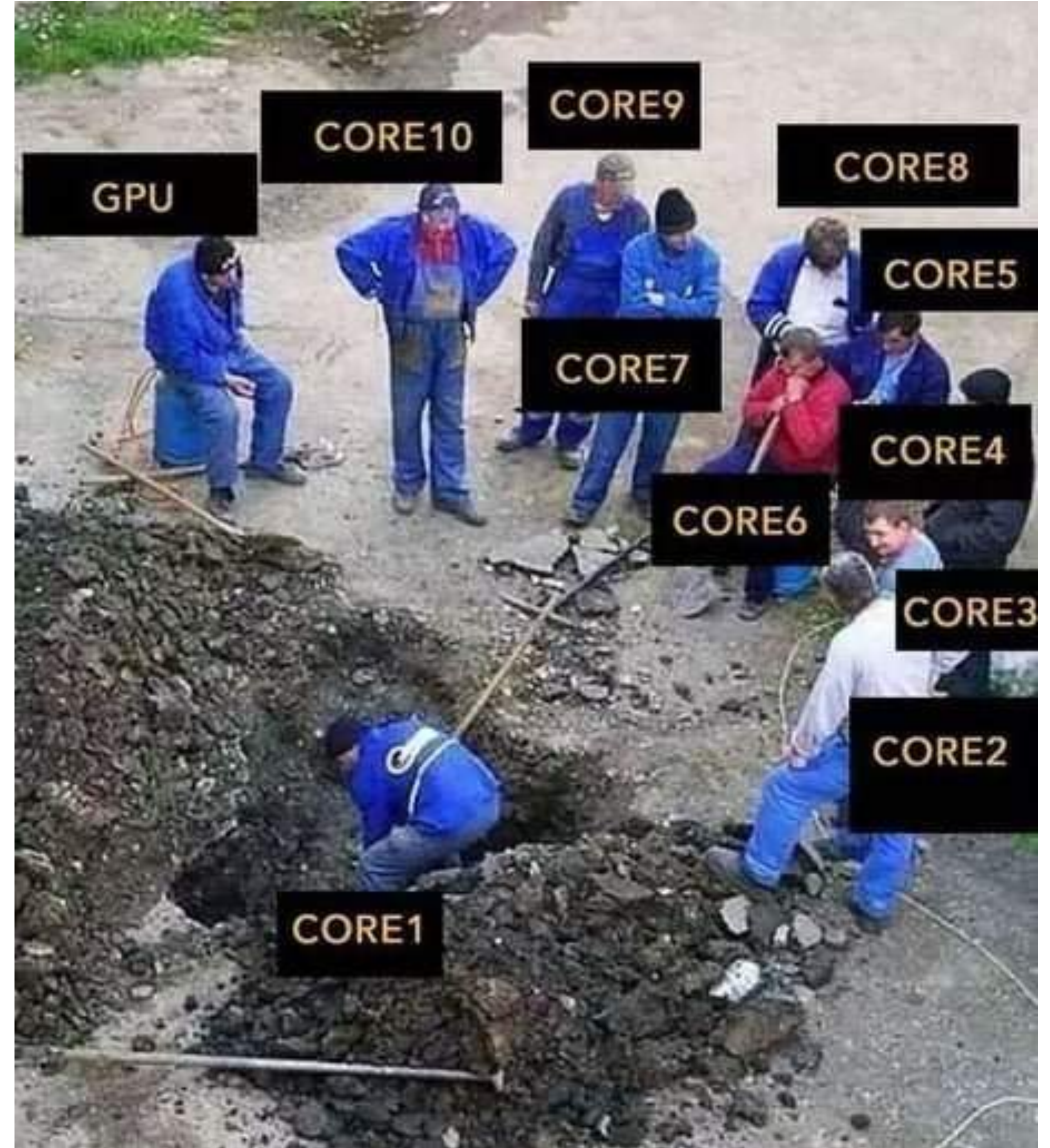
CSS OPTIMIZATIONS

- ▶ Avoid inlining images via Base64 encoding
- ▶ Avoid large stylesheets
 - ▶ Follow best practices and componentize your styles. Make them easy to delete
 - ▶ Don't worry about selector performance.
 - ▶ Inline CSS for critical path
- ▶ Split up monolithic stylesheets
- ▶ Chrome developer tools has a coverage tool that will help ID unused CSS (and JS).

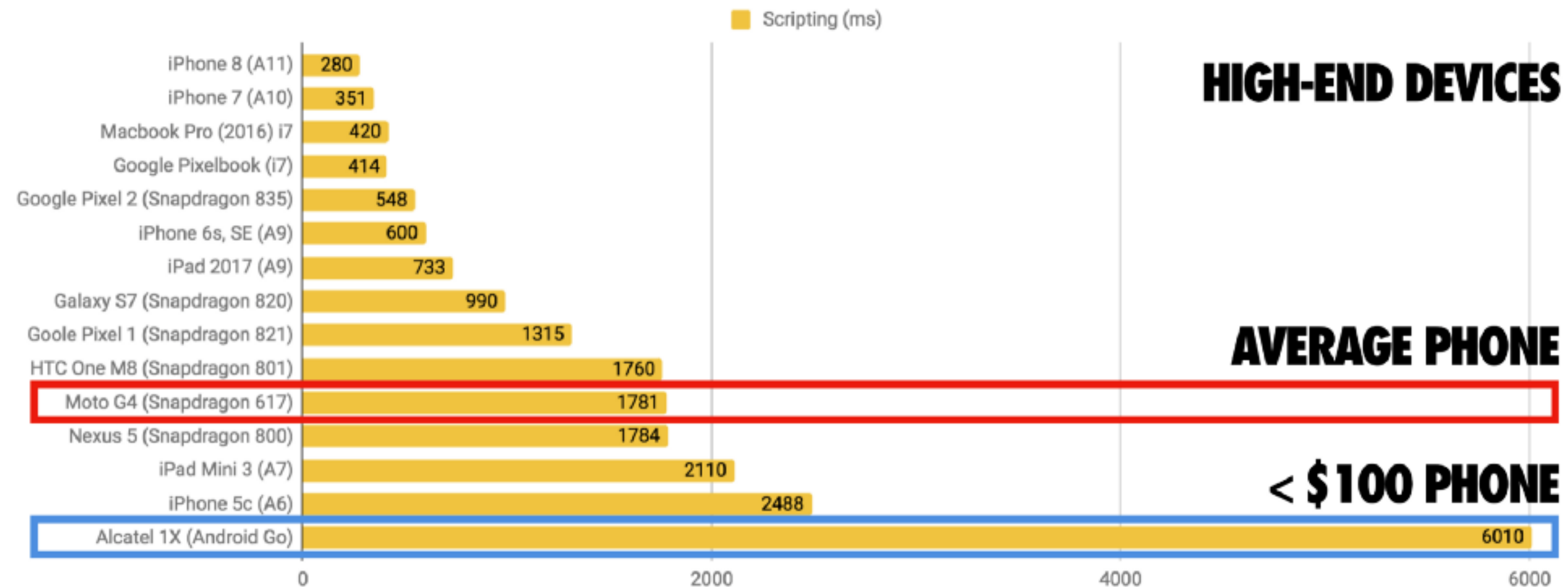
OPTIMIZE YOUR JAVASCRIPT

- ▶ Less JavaScript the better!

JAVASCRIPT MAIN THREAD EXECUTION



2018 JAVASCRIPT PROCESSING TIMES



Tests run during July, 2018 on hardware running the latest versions of Android and iOS available

1MB JS UNCOMPRESSED (200KB min/compressed)

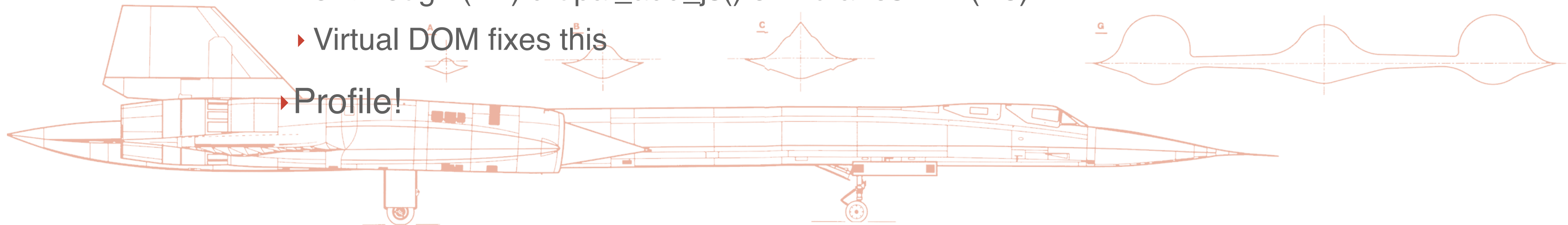
Processing (parse/compile) times for 1MB of uncompressed JavaScript (<200KB minified and gzipped) manually profiled on real devices. ([src](#))

<https://medium.com/@addyosmani/the-cost-of-javascript-in-2018-7d8950fbb5d4>

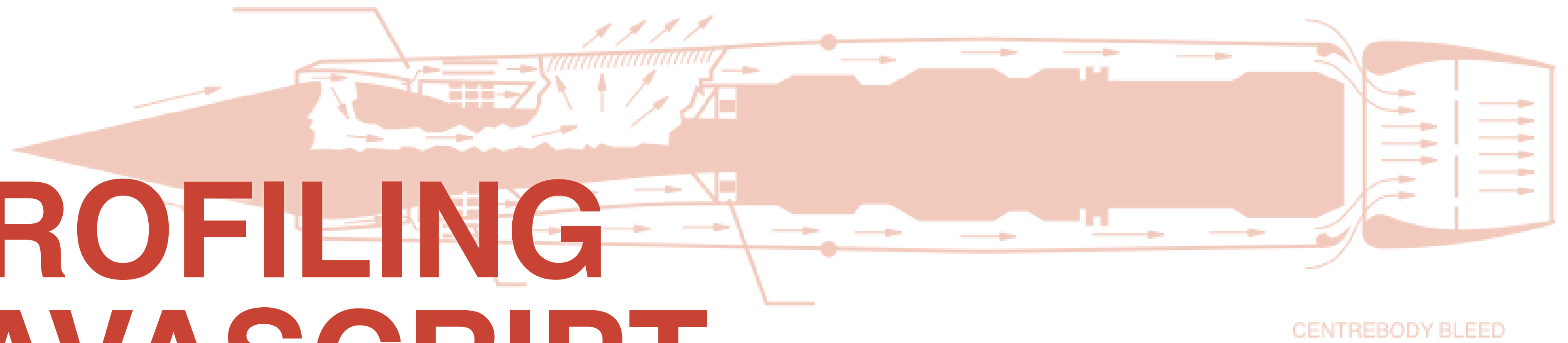
OPTIMIZE YOUR JAVASCRIPT

- ▶ Less JavaScript the better!
- ▶ Identify unused code through Chrome DevTools coverage tool.
- ▶ Identify 🤩🤩🤩 third party scripts.
- ▶ Code split
 - ▶ Either automatically through build tool (webpack)
 - ▶ or through (D7) drupal_add_js() or Libraries API (D8)
 - ▶ Virtual DOM fixes this

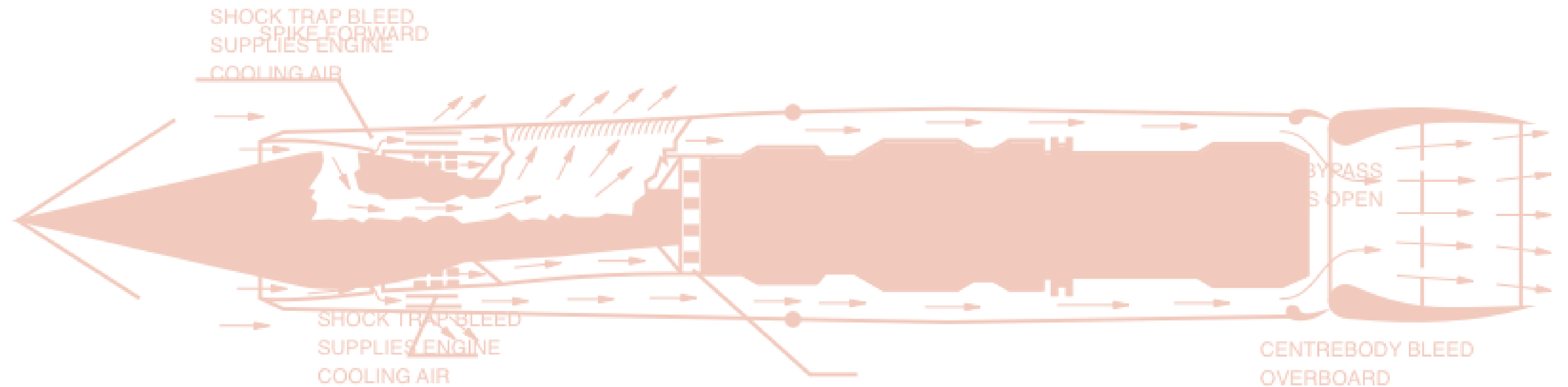
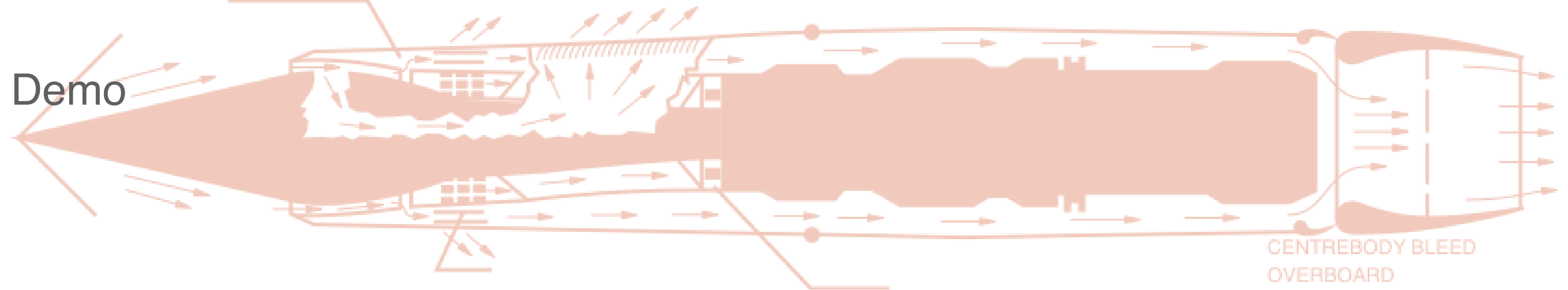
▶ Profile!



PROFILING JAVASCRIPT

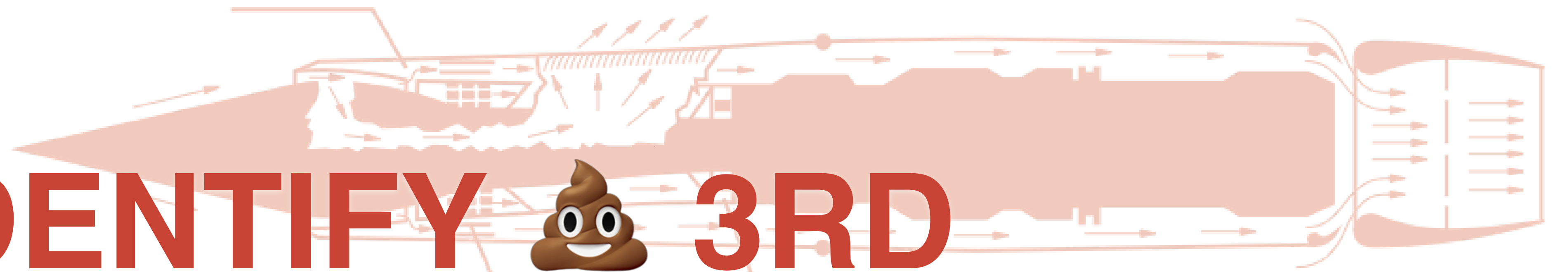


1. Demo

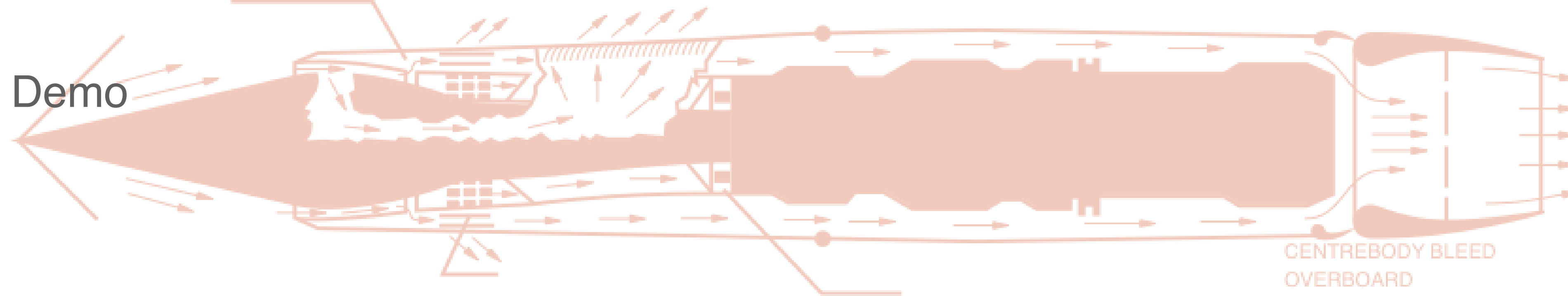


IDENTIFY 🍌 3RD PARTY PARTY SCRIPTS

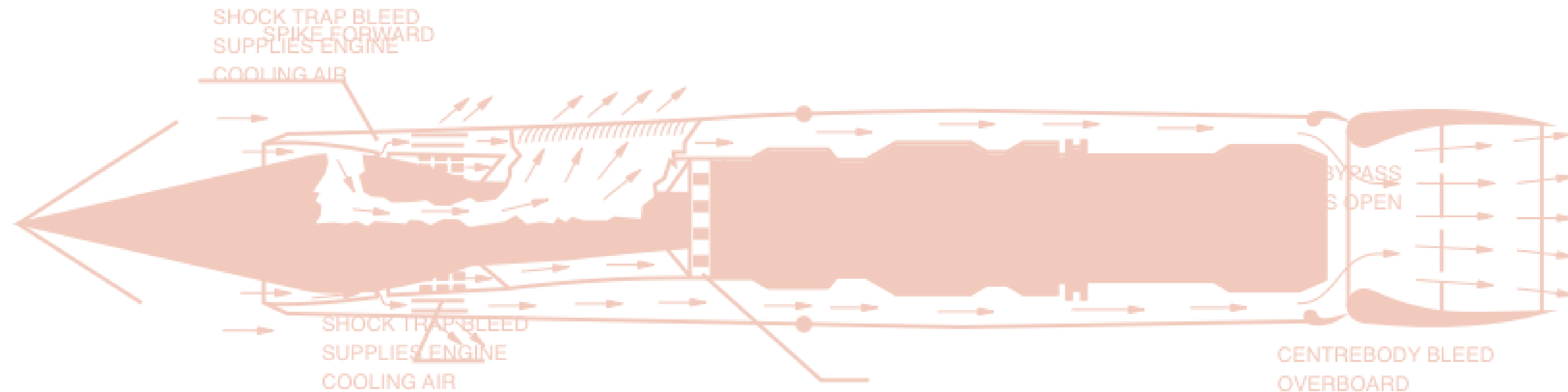
1. Demo



CENTREBODY BLEED



CENTREBODY BLEED OVERBOARD



SHOCK TRAP BLEED
SPIKE FORWARD
SUPPLIES ENGINE
COOLING AIR

SHOCK TRAP BLEED
SUPPLIES ENGINE
COOLING AIR

BYPASS
IS OPEN

CENTREBODY BLEED OVERBOARD

KEY TAKEAWAYS

(START DOING THIS TODAY!)

- ▶ Learn how to identify performance issues
 - ▶ Learn the metrics
 - ▶ Practice measuring these
 - ▶ Find the bottlenecks on your site!
- ▶ Less JavaScript
- ▶ Start using resource hints today!
 - ▶ Preload your fonts!
 - ▶ Async and then preload your scripts

MAKE THE WEB A BETTER PLACE!

Don't let proprietary solutions win!

THANK YOU!

Mike Herchel
Senior Frontend Developer at Lullabot
@mikeherchel